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CHEMICAL WAREHOUSE OPERATIONS: EXPERIENCE FROM SWIFT INTEGRATED LOGISTICS SDN. BHD.

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ABSTRACT

This article investigated the comprehensive risk management model practised at SWIFT Integrated Logistics chemical storage operations. The objective is to systematically illustrate the risk factors by identifying risks and mitigating them from the flow of the operation. By reducing or containing the risk factors, we are able to provide a conducive, safe, secure working environment with initiatives toward zero-incident reporting cases. A qualitative research method was applied in this study. Respondents selected for this study were at the managerial level at SWIFT Integrated Logistics with experience working in warehouse operations for more than five years. SWIFT Integrated Logistics management wanted to diversify its warehouse customer's portfolio and accepted new business opportunities in chemicals warehouse storage. The move contributed greatly to the business strategy and finance, but they faced serious risk management issues, which resulted in six (6) incidents and raised the level of anxiety and concern among the warehouse team on health & safety issues. Future studies may look into additional strategies to implement a better warehouse risk management model or plan for a chemical warehouse. This study suggested that regular or continuous training should be provided to the staff. Basic first aid kit training is an example of the mandatory training that should be part of the job standard operating procedure. This paper contributes to the limited existing study on chemical warehouse operations. Experience and measures taken by SWIFT management may provide some ideas to improve the management of chemical warehouse for other warehouse operators. Although chemical warehouse operation safety is important, there is scarce academic research that explores this issue.

Keywords: Chemical warehouse, incidents, chemical industry, chemical risk.

INTRODUCTION

A structured and systematic approach to reckon the risks are necessary (Timurlenk & Kaptan, 2012) when dealing with chemical warehouse operations. Skills to assess their severity and likelihood will provide better risk mitigation plans. This can only be achieved by adapting, adopting, and analysing systems, approaches, and models available in the industry. Based on Project Management Book, risk mitigation progress monitoring involves identifying new risks, tracking identified risks, and assessing risk process effectiveness throughout the project (Katende, Ann, & David, 2017; Project Management Institute, 2008).

SWIFT Integrated Logistics Sdn. Bhd. (SWIFT) was established in 2016, upon the acquisition of MISC Integrated Logistics Sdn. Bhd. by SWIFT Group. SWIFT provides the full range of land logistics services to customers, namely, Haulage services, Forwarding & Shipping, Project Logistics, Specialized Transportation, Warehousing, Cross Border Transportation, Container Depot Services, Inland Distribution and Sales, Services & Spare parts (SWIFT, 2020 (a)).

SWIFT operations are segmented into five regions nationwide, namely Northern Region (Butterworth & Padang Besar), Central Region (Port Klang & Melaka), Southern Region (Tebrau), Eastern Region (Kuantan & Kemaman), and East Malaysia Region (Kota Kinabalu & Labuan). Haulage services are predominantly the largest and anchor business unit of the organization and offer a fleet strength of 1,370 prime movers, 5,640 trailers. Warehouse business unit offers 1,655,000 square feet of storage space nationwide, and the SWIFT staff force stands at over 3,000 workforces (SWIFT, 2020) (b)).

SWIFT Integrated Logistics is an ISO accredited organization in ISO 9001 for Quality Management System, ISO 14001 Environmental Management System, and ISO 45001 Occupational Health and Safety Management System (SWIFT 2020 (c)). Northern Region operations is based at Butterworth, Penang, and an operations office at Padang Besar, Perlis. Butterworth base offers a similar full spectrum of land logistics services highlighted earlier. Padang Besar branch operations cater for cross border transportation of Southern Thailand cargo movement into Malaysia and return movement into Thailand.

Warehouse operation is a business unit (BU) in northern operations and offers a warehouse storage capacity of 273,000 sqft (SWIFT, 2020 (d)). The warehouse BU operates three warehouses: Warehouse 1- 93,000 sqft, occupied by customers Penfibre Film Sdn Bhd and Toray Plastic Sdn Bhd; Warehouse 2 -20,000 sqft occupied by several customers and this warehouse is converted as a full chemical-based warehouse and warehouse 3- with a capacity of 160,000sqft is managed by SWIFT warehouse team specifically for its customer - Penfibre Film Sdn. Bhd. at the customer's premise. Chemical warehouse operations are being regulated by several government agencies, including the Department of Occupational Safety and Health (DOSH), Ministry of Human Resources (MOHR), Ministry of Natural Resources and Environment (NRE), Royal Malaysia Customs Department (JKDM), Atomic Energy Licensing Board (AELB), Ministry of Science, Technology and Innovation (MOSTI), and Department of Environment (DOE), (Abdul Majid, Goh, & Lok, 2018). Several agencies' involvement shows the gravity of chemical issues in warehouse operations (Chemical warehousing, 2009).

Islam, Omar, Ghani, & Mat (2020) mentioned that world trade has developed exponentially in the latest decades, driven by dynamic liberalization and rising requests for energy resources. This is in-line with the diversification of business performed by SWIFT in order to meet the demands in the current volatile business environment.

In the 2nd quarter of the year 2019, warehouse 2 (20,000sqft) become vacant and the management decided to diversify its customer's portfolio by venturing into chemical storage. Since there was a strong inquiry into chemical storage from chemical importers in the Northern region, the company decided to

venture into chemical warehouse operations. As such, warehouse management secured three business opportunities with their customers - Nagase Chemicals (NAGASE), Merck Performance Materials (MERCK), and Nissei Chemical Corporation (NISSEI).

The three contracts enabled SWIFT to expand and maximise its commercial front, and warehouse 2 was fully converted and dedicated to chemical storage operations. Services rendered by SWIFT include storage, handling, loading & unloading, shrink wrapping, palletizing, pallets supply, cable tie, labeling, and other value-added services as per customer's requirement. Along with warehousing services, warehouse BU also offers other logistics chain services like haulage, forwarding (Customs brokerage) and trucking services (distribution) as one-stop services to its warehouse customers.

In the age of a knowledge-based economy, which is highly dependent on how to improve organizational innovation, the capability is an indicator for the survival of an enterprise. The key variable is technological innovation, and by doing so, it differentiates itself from the other competitors (Wen, Zailani, & Fernando, 2009; Sauvage, 2003). The business diversification decision made was spot-on in terms of business and revenue because the vacant warehouse two is fully occupied now, and the revenue stream is positive. Nevertheless, in terms of operations and the safety of workers, it becomes a worrying stake. The warehouse team was truly concerned about the risk of injury and health risks due to exposure to chemicals. Most importantly, the team does not possess the experience to handle chemical substances.

This is according to the emerging Industrial Revolution 4.0 where social and economic scenario focused on utilising more advanced technology and systems (Ikhsan, Islam, Khamis, & Sunjay, 2020). While utilising new technology may incur an additional cost, it is strongly adviced for an organization to implement effective practise of internal R&D, which gives an advantage to the company. The company may gain advantages and added value in three aspects, namely the ability to develop and grow critical human resources, dynamic involvement in the corporate R&D programme, and the ability to connect information. (Anuar, Zulhumadi, & Udin, 2012).

The management thought they could learn the "trade" along the way and manage the chemicals operations but little did they expect that they have limited time to learn because a small mistake might lead to detrimental effects to their workers, equipment and facilities. This situation will also have a huge impact on their future business relationship with new customers.

Knowledge in the area of chemical warehouse operations is very important to the SWIFT management team and the ground staff who handles it. Loke, Fakhrorazi, Doktoralina, and Lim (2020) highlighted that knowledge acquisition and knowledge utilization was still relevant to Malaysia's organizational business performance. Therefore, SWIFT's effort to acquire and utilise knowledge while handling the chemical elements carefully is in line with the effort to sustain their business in the longer run. Wang, and Wang (2012); and Wei-Kit, and Hidayah (2017) stressed that when Business Organisation understands the methodology and mechanism of knowledge management, it provides an advantage for them to face the challenging and volatile business environment.

The study contributes significantly to chemical warehouse operations by identifying a systematic risk management model to adopt. Structuring the operation flow with the model will assist warehouse management in achieving its objective in mitigating risk factors at the workplace and the ability to sustain the new business and ensure business continuity. Heydari, Lai, and Zhou (2020) mentioned that sustainability in the business cannot be taken lightly since it will cause severe effects to the company and affect their international firms, who are also their trading partners. Promoting a serious measure that emphasizes safety and security issues at the warehouse will help the business survive and prosper in the long run.

A systematic approach or model for apprehending the risk incidents lacks at the chemical warehouse, and upon implementation, risk factors can be identified, assessed, analysed and mitigated effectively. The objective is to ensure the potential risk can be reduced or contained and to provide a conducive and safe working environment fo warehouse workers. The damages from incidents/accidents and fire cases directly affect the organization's cost of doing business, environment, and human safety aspects (Auyong, Zailani & Suriety, 2011). Social Security Organisation of Malaysia (SOCSO) listed the cost impact in the 2017 annual report that RM 3.271 billion was paid out as compensation towards incident/accident cases. BOMBA (2017), registered a loss of RM 773,440 million from warehouse and store fire cases for the duration of 2015 to 2017.

Efficient building management is crucial, especially regarding the storage of chemical materials and handling because chemical is considered a hazardous substance. Appropriate handling of the chemical will influence the safety of the building, which in this case the storage warehouse for it to remain for a period of time, safe and in satisfactory condition without any damage and problem (Mohd Nawi, Salleh, & Anuar, 2014).
Every spillage and leakages area will incur clean-up cost, equipment replacement, and equipment repair (Miller, Stevens, Rath, Tenney, Kinnan & Pepple, 2013) and with an average of 215 cases of spillage a month (Bomba, 2017), the clean- up cost, equipment replacement and repair is a costly affair to be engaged with. The cost impact from the above sources will have a serious impact on organizations and drain their financial resources (Miller et al., 2013) if risk management is not considered seriously. Six incidents took place at the SWIFT chemical warehouse in the span of seven months since chemical operations commence in mid- 2nd quarter 2019.

Incident 1

One unit of intermediate bulk containers tank filled with 1000 liters of Nitric acid leaked overnight. On the next morning, when the staff opened the warehouse, a very strong odor was detected, and the warehouse was filled with dark brown smoke clouding due to the chemical reaction with the metal. During the effort to open the shutter doors and ventilate the area, the prolonged exposure affected the staff and caused temporary breathing difficulties & drowsiness, and absent from work for one (1) day. Root cause discovered that the bottom of intermediate bulk container tank cracked and this has caused the leakage. Potential risk factors that might happen include body injury (burn), toxic inhalation, asphyxiation, health risk, disease, polluted air, product damage, equipment damage, facility damage, and contamination.

Incident 2

Eight units of intermediate bulk container tank units were found bloated to the maximum, and another six units were bloating. The bloating was extreme and even expanded the iron structure surrounding the intermediate bulk container tanks. No leakage was reported but if the tank burst or cracked, another similar incident is expected. Top cap was opened, and the pressure was released by a chemical management organization (Experts) arranged by the customer. Potential risk factors include body injury (burn), toxic inhalation, asphyxiation, health risk, disease, polluted air, product damage, equipment damage, facility damage, and contamination.

Incident 3

Similar to incident 1 - one unit of intermediate bulk containers tank filled with 1000 liters of Nitric acid leaked but this time more than 48 hours from Friday night till Monday morning. Almost half of the warehouse is leaked with chemicals. The warehouse was totally shrouded in dark brown smoke due to a chemical reaction with the metal, and a very strong odor was also detected. The strong odor affected two staff members causing breathing difficulties, vomiting, drowsiness & throat irritation and absent from work for 2 days. The root cause was identified. The bottom part of the intermediate bulk containers tank cracked, which later caused the leakage. Potential risk factors include body injury (burn), toxic

inhalation, asphyxiation, health risk, disease, polluted air, product damage, equipment damage, facility damage and contamination.

Incident 4

Received one unit of 20' feet container with chemicals spilled inside the container. The odour from closed container was strong and eventually was opened to release the vapour. The container was ventilated for 24 hours prior to unloading process. Affected intermediate bulk containers units were isolated and was taken out by the experts again. Although after 24 hours, staff still felt hand and throat irritation. Root cause was discovered. The top cap was opened during the container transit and has resulted in spillage. Potential risk factors include body injury (burn), toxic inhalation, asphyxiation, health risk, disease, polluted air, product damage, equipment damage, facility damage and contamination.

Incident 5

One unit of intermediate bulk container tank filled with 1000 litres of Hydrochloric acid released its vapour inside a warehouse. The top cap of the intermediate bulk container tank was detached; thus, vapour is released. This chemical does not have strong odour, thus only if when we are in the vicinity, the odour can be detected. No leakage was found but staff experienced burning sensation in their eyes. Upon medical attention, the staff was cleared with one-day rest. Root cause was discovered. The top cap was detached and released vapour. Potential risk factors that might occur include body injury (burn), toxic inhalation, asphyxiation, health risk, disease, polluted air, product damage, equipment damage, facility damage and contamination.

Incident 6

During pick-up process, one unit of intermediate bulk container tank (Hydrofluoric acid) slipped away from the fork rail during transit and hit two drums. One unit of the drum was dented together with the intermediate bulk container tank, but no leakage was found. Root cause was identified when the forklift driver failed to tilt up the fork rail during movement. It has resulted in intermediate bulk container tank to slip away. Hydrofluoric acid is a dangerous acid that can cause combustion and potential fire. Driver's carelessness leads to the incident. Potential risk factors that might occur includes body injury (burn), product damage, equipment damage, fire, combustion and facility damage.

LITERATURE REVIEW

Chemical Industry Outlook

Global chemical industry has recorded a steady growth for last six years. Asia region particularly posted continuous growth of 4.5% in 2015 and 5.1% in 2018 in year to year running (Eramo, 2018). Its growth forecast from year 2019 to 2022 reflects strong progress of 3.1 % (2019), 5.0% (2020), 3.0% (2021) and 4.6% (2022). This is a windfall situation across Asia and Malaysia will gain from it.

Table 1

Export and Import Value's for Chemical & Chemical Industries from 2010 till 2018- Malaysia

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018
Exports (RM Billion)	28.9	32.3	32.4	33.5	35.8	39.4	41.4	47.1	57.7
Imports (RM Billion)	43.6	48.9	49.3	52.5	58.4	61.4	63.8	74.5	82.7

Source: MITI (Ministry of Trade and Industry), 2019

MITI (Ministry of Trade and Industry), (2019) provides the export & import values of chemicals from the year 2010 till 2018 (Table 01). Table 1 explains both the chemical exports and imports have increased year by year from 2010 to 2018 (9 years). Exports increased from RM 28.9 billion (2010) to RM 57.7 billion (2018), and imports increased from RM 43.6 billion (2010) to RM 82.7 billion (2018).

Malaysia is a net importer of chemical substances every year, and the import value supersedes export. A large number of chemicals are being used in industry as raw materials for the production process, and thus, the demand and requirement for chemical storage are relevant and urgently required. Drawing attention to its significance, in the year 2018, the industry contributes RM 140.4 billion in export and import transactions. SWIFT's new business direction into chemical storage facilities is well-timed as it offers widespread opportunities for development & expansion.

Ikhsan, Islam, Khamis & Sunjay (2020) highlighted in their study that the emerging trends of the digital economy bring huge potential and challenges to the business world, especially regarding the supply of goods and services through technology. Hence, integrating the chemical storage business with the current normal warehouse business is crucial. This is echoed by Anuar et al. (2012), who supported the argument that internal R&D within the organization gives added value to the company in the long run.

According to Liu, Li, and Li (2017); Wang et al. (2012); and Sorensen et al., 2013), if any incident/accident such as leakage or spillage occurs, the operations go out of control, and this can potentially cause unwanted scenario of a fire, explosion, body injury and pollution to the environment. Therefore, due to the high exposure level and risk potential, workers' protection is crucial and, simultaneously, applying and implementing appropriate preventive measures to contain the risk factors (Naumovska & Čaloska, 2015).

Chemical Warehousing Outlook

Chemical warehouses in Malaysia are limited in the market as compared to general warehouse operations (Abdul Majid, Goh, &Lok, 2018). Manufacturers mostly maintain their own chemical storage (Aqlan & Ali, 2014). Thus, public chemical warehouses are limited despite the growth in chemical industries and high usage across the industries. Importers and distributors vastly patronize chemical warehouses for their storage and distribution purposes (Xiong, Nyberg, Dong, & Shang, 2015).

Storage of various forms and characteristics of chemicals exposes warehouse operators to varying levels of risk, and not all chemicals present the same hazard and effect. Some are flammable, toxic, corrosive, emit gas, and radioactive in nature (Wang, Xie, & Liu, 2012). Due to its delicate storage nature, traffic in the chemical warehouse is often high, and together with both the machine factor (forklifts & tools)

and the human factor (workers and dwellers) working in close proximity, there is a high probability for the incident to occur (Szymonik, 2018).

Chemicals Characteristics

There are nine classes of chemicals. DOSH (Department of Safety & Health), (2014) & Sorensen, Janssens, Lasgaa & Witlox, (2013) provided the details of the dangerous goods (DG) classes as follows: Class 1- Explosives, Class 2 - Gases, Class 3 - Flammable Liquids, Class 4 -Flammable Solids, Class 5 - Oxidizing, Substances, Class 6 - Toxic & Infectious Substances, Class 7 - Radioactive Material, Class 8 - Corrosives and Class 9 -Miscellaneous Dangerous Goods.

The understanding of chemical storage compatibility is important as the first step towards avoidance of potential risk. Sorensen et al. (2013) explain that DG (dangerous goods) has its own standard of storage, set up by legislation to minimize the potential risk exposure.

Table 2 provides the chemical storage compatibility matrix for the understanding of safe storage process. With the matrix, the warehouse team would be able to know which chemicals are compatible with co-storage and which chemicals are not.

Table 2

Dangerous Goods Class Compatible Matrix

Description	**Class**	2.1	2.2	2.3	3	4.1	4.2	4.3	5.1	5.2	6.1	8	9	**Combustible Liquid**
Flammable Gas	2.1													
Non-flammable Gas	2.2													
Toxic Gas	2.3													
Flammable solid	3													
Flammable Liquid	4.1													
Spontaneous Combustion	4.2													
Emits Flammable Gas when contact with water	4.3													
Oxidizing combustion when contact with oxygen	5.1													
Peroxides-Unstable substance, accelerate heat and can cause explosion	5.2													
Toxic substances	6.1													
Corrosives	8													
Miscellaneous DG	9													
	Combustible Liquid													

Source: (Sorensen, *et al.*, 2013)

	Compatible in many cases with exception
	Likely incompatible, segregation or separation needed

Decisions can be made to either segregate or separate the non-compatible chemicals in the storage area to reduce and contain risk exposure and avoid knock-on effects, should incidents occur. Compatibility

in yellow means chemicals can be co-stored together. Compatibility in white means the chemicals need to be segregated or separated in storage and cannot be co-stored together. This guide serves as the first step in avoiding risk.

In this study, the accident sequence can be compared to the analogy of the Domino Theory. The sequence begins with an injury caused by accident. This accident was due to an unsafe act and/or mechanical or physical hazard. It was due to the; fault, which was caused by their; ancestry and Social Environment (Disaster Management Institute, Bhopal, 2020). This study rationalized that Domino Theory reflects the working structure of the chemical warehouse operations. Implementing the required manpower, material, and knowledge are essential tools needed. By applying the Domino Theory, an organization would minimize the risk as described in the table above.

Heinrich further elaborates that there are four reasons why people commit unsafe acts, i.e., improper attitude, lack of knowledge or skill, physical incompatibility, and improper mechanical or physical environment (Disaster Management Institute, Bhopal, 2020). This suggests how important, regular training should be conducted (Ljubić, Raković, Dimitrov, & Garvanov, I. (2016)., awareness programme to be organised continuously (AuYong, Zailani, & Surienty, 2012) and also more safety precautions (Hofstra, Petkova, Dullaert, & Reniers (2018) to be implemented. It will benefit the warehouse and instill trust among trading partners to utilise the company's chemical warehouse due to the stringent and highest standard operating procedures that were put in place.

Risk Relationship in Chemical Warehouse

Risk was derived from Italian word "*risicare*" which means "to dare", (Shahbaz, Bin & Rehman, 2017) and has remained as a negative consequence and unfavourable event traditionally. Risk is deemed as a combination of the probability of the risk happening and the magnitude of the incident (Tummala & Schoenherr, 2011).

There are two dimensions to risk: uncertainty and consequences (Ustundag, 2012), and risk is the main cause of uncertainty in any organization. Fiksel (2015) added risk is seen as a threat in the business world. Business continuity is affected by potential financial loss, product damage, and injuries. Therefore, risk needs to be avoided, reduced, contained, or eliminated because of the impact hinders organizations from achieving their goals (Ustundag, 2012).

In contrast, Hillson & Murray-Webster, (2017); Fadun, (2013); and Kannan & Thangavel (2008) explains, the risk is an essential part of the business in the modern industrialized era. Without risk and risk-taking, organizations cannot operate either to expand or to improve their productivity. Fadun (2013) further explains that risk is a crucial factor in enhancing organisations activities, business sustainability, and economics. Hillson & Murray-Webster, (2017) and Drucker (1997) expressed that business can only grow and improve to the next level by becoming a greater risk-taker.

Waters (2007) specified four (4) types of risk, i.e., Physical risk, Financial risk, Information risk, and Relationship risk. Physical risk relates to the movement and storage of materials, including risk of transport, storage delivery, material movement, and inventory system. Potential risks are late deliveries, interrupted transport, damage to goods, shortage of stock, missing product, accidents, etc. This study is more inclined to physical risk as to its mirrors chemical warehouse operations.

From literature gathered on chemical warehouse operations and warehouse operations, the author identified eleven potential risk factors that SWIFT may face in the future if relevant actions are not taken decisively.

Table 3

Potential risk factors.

No	Risk	Authors
i)	Accident	Elbarky& Morssi, 2016; Bouloiz et al., 2013; and Gnoni et al., 2012;
ii)	Product damage	Bragatto et al., 2014; and Ustundag, 2012;
iii)	Equipment damage	Bragatto et al., 2014; and Wang et al.,2012;
iv)	Property/Facility damage	Sörensen et al., 2013; and Gu et al., 2010;
v)	Body injury-	Xiaoliang et al., 2017; Sörensen et al., and Wang et al., 2012;
vi)	Spillage & Leakages	Aqlan & Ali, 2014; and Sörensen et al., 2013;
vii)	Toxic gas release (dust and vapor cloud risk)	Tjoe-Nij et al., 2018; and Bragatto et al., 2014;
viii)	Toxic inhalation (choking)	Tjoe-Nij et al., 2018; and Bragatto et al., 2014;
ix)	Health risk (Disease, Organ Damage, Long term health risk) - (	Xiaoliang et al., 2017; and Wang et al., 2012;
x)	Fire; Combustion/Explosion-	Zhang, 2018; and Liu et al., 2017;
xi)	fatality-	Wang et al., 2012; and Huang, 2012.

Source: Author's compilation

RESEARCH METHODOLOGY

This study employs a qualitative research approach to investigate the experience of SWIFT Logistics in operating its chemical warehouse operations. Since SWIFT is one of the main players in the logistics industry, their experience in dealing with the chemical warehouse would provide better perspectives on issues that need to be addressed. The annual report provided by SWIFT Logistics is the main reference that is used in this study.

Apart from that, senior management were identified as the respondents with regards to cases or incidents reported. Respondents chosen were key people in the warehouse operations with a minimum of five-year experience. They are mostly managers in their respective warehouses. Dealing with chemical substances are the new challenges that they learned throughout their career in warehouse operations. Their insight and comments were useful in gaining a clear picture of the overall issues highlighted. They also play a key role in Knowledge Management implementation (Nawab *et al.,* 2015).

ANALYSIS AND FINDINGS

Critical sources of the incident in chemical warehouse operations are from its handling activities (product loading, unloading, organizing, storing, and packing), which represent a critical process in chemical warehouses (Bragatto, Pirone & Gnoni, 2014). According to Auyong, Zailani, and Suriety (2011), the logistics sector, including chemical warehouses, has the highest share of occupational safety and lost time injuries. Any mishandling will potentially involve accident, spillage, toxic releases, or fire and caused a detrimental impact on the organization and its workers. Statistics gathered from DOSH & Rescue Department (BOMBA) pointed out that more attention is required for future handling of chemical products in warehouses.

Table 3

Occupational Accidents Statistics by Sector of Transport, Storage & Communication: 2015 – 2019 (June)

By sector: Transport, Storage & Communciation	2015	2016	2017	2018	2019 (June)	Total
Non-Permanent Disability (NPD)	107	113	105	124	150	599
Permanent Disability (PD)	2	2	1	1	2	8
Death	22	12	16	12	9	71
Total	**131**	**127**	**122**	**137**	**161**	**678**

Source: DOSH, Malaysia-Occupational Accident Statistics (2015-2019 Jun)

Department of Safety and Health (2019), reported that, according to the Transport, Storage, and Communication sectors, a total of 678 cases were recorded from 2015 to 2019 (June). Five hundred ninety-nine cases with NPD (Non-Permanent Disability), 8 cases with PD (Permanent Disability), and 71 cases of Death.

On average (4.5 years), NPD cases registered 12 cases monthly, followed by PD cases, 0.15 cases monthly, and Death at 1.3 cases monthly. Statistics of 2019 (6 months) is even more alarming because the total cases of 161 supersede the total cases recorded throughout the whole year 2018 (137 cases). On average, within 6 months, NPD has 25 cases monthly, PD has 0.33 cases, and Death has 1.5 cases monthly. Every month, 25 people are getting injured, and 1.5 people perished on duty. Chemical warehouse operations directly contribute to these statistics and require the utmost attention and action plan to reduce these numbers.

Source: BOMBA Annual Report, 2017

Figure 1: *Spillage and Leakage Cases of Hazardous Product (2007 – 2017)*

Figure 1 indicated that spillage & leakage cases of hazardous products (2007-2017), (BOMBA, 2017), the number of cases escalated from 786 cases (2007) to 2,589 cases (2017), an increase of 229%.

Year 2017 recorded the highest spillage & leakage cases, and on average, 215 cases happened in a month. Fire incident from storage facilities, (BOMBA, 2017) stated that 1,560 fire cases occurred from 2013 to

2017 (5 years). About 213 cases per year were recorded and an average of 26 cases of fire incidents occurred every month. For both spillage & fire incidents, one of the contributing factors was the mishandling of chemicals.

Actions Taken by the management

The warehouse management realised that there is a serious gap of chemical product handling knowledge compared to other general products. Each chemical has its unique characteristics and different degree of hazard. They realised that warehouse operation staff do not know what to do when chemical incidents occurred. Lack of product knowledge and risk awareness associated with each chemical stored in the warehouse will jeopardize warehouse operations' total safety process.

The lack of awareness happens when the warehouse operators do not know how to handle the chemicals safely under each warehouse task. They do not possess the knowledge of different chemicals' handling procedures and how to create and maintain a safe workplace. What type of training is required to share the knowledge and awareness on how to handle and react when a major incident (spillage, fire, body injury and fatality) occurred? Recognising the importance of PPE (personnel protective equipment) is also an important factor in mitigating risk at the workplace. Fear of long-term health risk hovers if the warehouse failed to implement a systematic approach to identify and mitigate risk effectively. Long-term health concerns of the staff will become a serious issue to the management.

Armed with the background information of ISO 45001 (Occupational Health & Safety), SWIFT believed they can maneuver the situation, but chemical handling is a different ball game entirely compared to the haulage service safety procedures, which is the anchor business unit and general warehouse cargo safety. Although the ISO 45001 standard plan can be used as a reliable guide, more input is required for the chemical handling process. Workers' lives are at stake if no systematic handling process that specifies risk awareness is adopted and or adapted in chemical handling operations processes immediately.

The effect of any major incident will leave a negative impact on the SWIFT warehouse business unit. Warehouse operations and business will be deemed as an unsafe storage place. Customers will lose confidence in SWIFT in how well their products are being taken care. The impact may lead to a loss in reputation and loss in a relationship, apart from loss in revenue and loss in business, since products will be retrieved from SWIFT storage facilities.

The chemical storage business unit will be affected, but other general ambient storage facilities will also be affected due to the negative impression and perception garnered. Product damage, fire, body injury, spillage or fatality will disrupt customers' supply chain activity, which could result in claims on product damage, claims on production stop at manufacturing plant, and cost of logistics for immediate replacement of products. SWIFT will also be subject to an insurance claim from customers whose products were damaged due to accident, spillage, and fire incidents.

All the above lefts negative impression on warehouse operations and business at large. Unintentionally, warehouse's inadequate reaction to any chemical incident might further exaggerate the situation if warehouse operators do not know how to contain the risk when it is still "small" and less dangerous. Objectively, mitigation of risk helps to ensure business sustainability and business continuity.

CONTRIBUTION OF THE STUDY

This study has contributed to a better understanding on chemical warehouse operations. Due to several incidents or accidents, they are the most valuable lessons that management can learn from. This provides

new richness to the area of chemical warehouse operations dimensions of the logistics industry in Malaysia.

Besides, this study has also contributed to the existing literature on chemical warehouse operations dimensions to enhance warehouse operations in the logistics industry. Moreover, the findings and discussions in this study are valuable, especially to the logistics industry players.

Middle-level managers must pay more attention to their own roles in warehouse operations particularly when dealing with chemical substances, as this will influence the organizational business performance. Additionally, the logistics industry in Malaysia can utilise this study better to understand the practices of current chemical warehouse operations.

Since Malaysia is categorised as a middle-income level country, this study's outcome would help in recommending that managers focus on Knowledge Management in chemical warehouse operations in developing Business Performance for better contribution to national growth (Loke, Fakhrorazi, Doktoralina, & Lim, 2020).

CONCLUSION AND RECOMMENDATION

It can be concluded that, in order for effective SWIFT chemical warehouse operations, SWIFT needs to engage with a suitable and comprehensive risk management model. From there on, they can help formulate a structured process and help reshape the operations. It will also help to improve the work-flow process in the warehouse operations. SWIFT must improve and upgrade its internal and external processes to ensure they achieve the objective and work towards zero-incident reporting in the warehouse.

Lesson learned from the experiences handling product leakage, spillage, smoke clouding, product damage, breathing difficulty, drowsiness, vomiting and skin irritation has caused much concern and anxiety to SWIFT management. The six incidents provided post-impact, both operationally and financial to SWIFT, and also put a dent into effective management and handling of chemicals in the eyes of the authority-DOSH.

The incidents that occurred have delivered a dramatic irony - 'what SWIFT is dealing with is no ordinary stuff, and nothing should be taken for granted.' It sent a vibrating feeling and sense of danger and risk to working people. The first response from people engaged in warehouse operations is that, if given an opportunity, they wish to get away from this workplace. No one wants to jeopardize their safety and health in the long run.

Distress and fear of accidents taking place at the workplace is slowly encroaching on operations staff and forklift drivers. They know that an accident will lead to product damage or spillage or body injury or fire and/or fatality and equally endanger their life if mishandling and mistake occurred. The safety, health, and life of internal staff matters, but warehouse dwellers and members of the public become the stakeholders in this matter.

Knowing the degree of risk exposed to staff, dwellers, and business is crucial so that warehouse operators can mitigate risk for a safer working environment. Unlike other general cargo, chemical cargoes are hazardous and should not be handled carelessly. The more ignorant we are in handling it safely, the more inclined we are to incidents or accidents.

Basic first aid kit training is an example of mandatory training that warehouse operation staff need to undergo and become part of their job routine. Regular safety and security training are also compulsory

for them since any single mistake in handling chemical substances will cause life apart from financial losses.

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